

The Gambles Mill Corridor:
A Future Flourishing Terrestrial Habitat

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Abstract

The Gambles Mill Corridor is a latent campus space that offers the potential for ecological stewardship and local connectivity. Currently, the area supports limited bird, small bee, and aggressive invasive plant populations. In order to promote the long term sustainability of a dynamic and flourishing terrestrial habitat in the corridor, this proposal focuses on flora and fauna in the area. Additionally, excessive nutrient and sediment runoff from upslope land harms the Little Westham Creek, and, more broadly, the health of the James River and the Chesapeake Bay. Through the careful and sustained replacement of invasive species with native plants and the strengthening of the Little Westham Creek's riparian buffer zone, we will help the corridor's flora provide better habitat to fauna and better water quality for the watershed. Additionally, by installing birdhouses and bat houses, and planting bee-attracting plants, we will help the corridor support species such as the brown-headed nuthatch, the bluebird, the big-eared bat, and the american bumble bee. By promoting, expanding, and sustaining the area's natural flora and fauna, we will transform the Gambles Mill Corridor into a centerpiece of campus, demonstrating the University of Richmond's dedication to connectivity, experiential learning, and ecological integrity.

Introduction

Small projects can seem insignificant at first glance; however, the Gambles Mill Corridor project will have an immeasurable impact on campus connectivity and third spaces, student health, and the growth of environmental stewardship on campus and beyond. This proposal is intended to serve as a

model for other colleges and institutions. The University of Richmond's 2011 Master Plan emphasizes improving third spaces on campus (Ayers 2011). The Gambles Mill Corridor will act as an area that exists outside of academic buildings and residence halls that provides opportunities for student growth and interaction, thus fulfilling the need to improve third spaces. Furthermore, by restoring the Gambles Mill Corridor, students will have increased connectivity to the city, as the corridor connects the university to a nearby shopping center. Finally, the Gambles Mill Corridor is located within the Little Westham Creek watershed, which sits within the James River watershed, which is located within the Chesapeake Bay watershed. The Little Westham Creek does not exist in isolation and it is the university's duty to be a good steward of the watershed for the benefit of not only our own campus, but for the world.

Background: Flora

Invasive Vegetation Species. We are interested in controlling invasive, i.e. non-native, species. However, we are most committed to removing species which aggressively inhibit the growth of ecologically beneficial plants. Insofar as invasive species inhibit these plants' growth, we will use the terms invasive and aggressive interchangeably, and will note when an exception occurs in the form of a non-aggressive invasive of little concern or an aggressive native of much concern. Poison Ivy is an example of this distinction. It is a native species, but we recommend treating it the same way as an invasive species because of its aggressive spreading and allergenic oil.

Invasive Species Control. There are a multitude of conventional methods for controlling invasive species. The three most common techniques are chemical control, mechanical control, and site modification. Chemical control involves spraying a general herbicide such as Roundup to kill all plants in an area or a selective herbicide that only kills certain types of plants. Mechanical control involves selectively hand-pulling unwanted species, either by hand or with tools, or repeated mowing. Many site modification strategies exist, including changing soil chemistry, changing soil pH, repeatedly disturbing

the soil through tilling to prevent seed growth, and selective burning (Wooten 2010). For the ecosystem of the Gambles Mill, burning and tilling are too destructive, and other site modification methods are too labor or capital intensive. We therefore recommend a combined approach of mechanical methods whenever possible, and minimal chemical treatment when necessary.

Current Invasives. Most invasive species in the Gambles Mill Corridor fall into one of three categories: shrubs, vines, or grasses. Except for English ivy, Chinese privet, and sericea lespedeza, all of the following are given a high invasiveness ranking by the Virginia Department of Conservation and Recreation (Virginia Department of Conservation and Recreation 2015). Winter Creeper, Mimosa, and English Ivy are given a medium invasiveness rank, but are still a problem for the corridor.

- **Japanese stiltgrass** (*Microstegium vimineum*) spreads aggressively in disturbed areas, and can grow in most conditions. It is relatively easy to pull by hand, but the process must be repeated for several years until the seed bank in the ground is depleted. If it is mowed or cut, it will grow back and rebloom unless the mowing occurs in late summer or fall (National Park Service 2014).
- **Multiflora rose** (*Rosa multiflora*) is a shrub that grows aggressively and prevents native shrubs from growing, limiting the amount of bird habitat. It is best controlled through repeated, frequent mowing or individual cutting (3-6 times per year, 2-4 years). Because of its sharp thorns, we recommend treating denser patches with glyphosate rather than hand-removing plants (National Parks Service 2014).
- **Japanese Honeysuckle** (*Lonicera japonica*) is a fast-growing, perennial vine that smothers small shrubs and vegetation, and girdles saplings and large shrubs. It can be controlled by hand removal. Like other vines, cutting without applying herbicide will require close monitoring to remove new sprouts (National Park Service 2014).
- **English Ivy** (*Hedera helix*) is a hardy, aggressive vine that suppresses ground vegetation and impedes tree growth by climbing trees and blocking sunlight. It grows on the ground like a web, and

can be effectively removed by pulling up the entire vine system. To kill English Ivy on trees, the vine should be cut in two different places about a foot apart near the base of the tree, and the segment in between should be removed. Glyphosate should be applied to both sides of the remaining vine (National Parks Service 2014).

- **Porcelainberry** (*Ampelopsis brevipedunculata*), a member of the grape family, grows thickly and forms dense blankets on the ground that smothers other plants. It climbs trees 15-20 feet and blocks sunlight from lower leaves. Like most other vines, it can be removed by hand-pulling, but due to its deep root system we recommend applying herbicide to cut stems to kill the entire root (National Park Service 2014).

Case Studies. This proposal considers the following examples as models.

In 2015, a coalition of organizations from the city of Richmond led by Vanasse Hangen Brustlin, Inc. banded together in order to share goals and strategies related to invasive species management within the James River Park System (James River Park System 2016; Vanasse Hangen Brustlin, Inc. 2016). The long term project has four stages: project initiation (review and unitization of park boundaries), inventory (park system-wide study and identification of invasives species), control (actual implementation of management practices), and monitoring (self assessment).

In 2012, the state of Virginia developed an invasive species management plan based on seven goals: coordination, prevention, early detection, rapid response, control, research, and education (Virginia Invasive Species Advisory Committee 2012).

In the summer of 2014, the city of Richmond completed a restoration project on a segment of Albro Creek, located behind the Bellmeade-Oak Grove Elementary School (Reedy Creek Coalition 2016). The project's results were not sustained. Construction left the streambanks covered in exposed soil which eroded downstream and invasive species quickly took over the area. In 2006, a coalition of community members joined forces to restore the buffer zone of a segment of the Little Westham Creek

(Newton 2006; Newton and Community Leaders 2006). Native vegetation was planted along the banks of this one mile section of the creek that traveled through sixty private properties, and was allowed to grow freely.

Background: Fauna

Birds. We focused on two bird species: the brown-headed nuthatch and the bluebird. The brown-headed nuthatch is rapidly declining, just as the bluebird population did in the late 20th century, due to deforestation and urbanization (Hayes et al. 2004, Mehlman 1997). We have personally observed that these species can be commonly found on the Gambles Mill Corridor while sightings are quite uncommon elsewhere in the city. This is in part because the wooded area of the corridor has loblolly pine trees and an open understory. There are currently five birdhouses in the corridor. In order to promote native bird species on campus, we will construct additional birdhouses to provide habitat for the brown-headed nuthatch and bluebird (Figure 2).

Bees. The University is currently installing a new beehive behind the University Chapel, and the Gambles Mill Corridor is an excellent location for these bees to come and pollinate. We propose planting a range of bee-friendly flowers that are outlined below, in order to attract those bees and any other hives within the half-mile radius within which bees travel to pollinate.

Bats. In Virginia, there are 16 different species of bats. Of these, the Gray, Indiana, and Virginia Big-Eared Bats are listed as federally endangered species (Johnson et al. 2005). Specifically, the Big-Eared bat has been spotted around the eastern Virginia area. By placing bat boxes along the corridor, we will be providing habitat for this endangered species as well other bat species that may be facing population decline.

Objectives

Goal: To promote the long term sustainability of a dynamic and flourishing terrestrial habitat

1. Replace invasive plant species with native plant species

2. Strengthen riparian buffer zone
 - a. Post-construction management: Restore disturbed vegetation in order to cover exposed soil and prevent erosion in the long term
 - b. Improve nutrient filtering processes for upslope water that flows into the stream
3. Promote, expand, and sustain the presence of native wildlife in the corridor with added emphasis on bird, bat, and bee populations

Proposed Action: Flora

Creation of Zones. We created eleven zones to segment the corridor into more manageable sections (Figure 1). We classified zones based on the predominant plant species and physical characteristics that define different sections of the trail. Invasive species removal techniques and new vegetation species can be tailored to fit the specifics of each zone. See the interactive map at <http://arcg.is/0KH9az> for more information.

Invasive Vegetation Removal. Whenever possible, we recommend hand-pulling invasives, consistent with the University's Integrated Pest Management (IPM) policy. This will be easiest for invasive grasses and should be done in late summer to early fall to avoid spreading seeds. We also recommend hand-pulling all shrubs except multiflora rose, and hand-pulling ground growth of invasive vines. However, it will be difficult to deal with certain invasive species, either because of their ubiquity or their resilience, without using chemical herbicides. For invasive vine species growing up trees, and especially for Porcelainberry, we recommend spot-treating cut vines with glyphosate to kill the entire root system. We recommend against spraying a broad-spectrum herbicide to minimize disturbance to the ecosystem and to the Little Westham Creek.

Vegetation for Fauna. Snags can be left standing to serve as habitat for woodpeckers and other bird species. Plants, such as buckwheat, can serve as a one or two year cover crop immediately after invasive species are removed. This example plant can grow in harsh conditions, and will attract bees

while serving as food for white tailed deer (Sheppard 2012). Other vegetation will provide similar benefits for fauna.

Vegetation as a Buffer. The stream's riparian buffer zone officially extends approximately 200 feet away from each bank (Hawes and Smith 2000; Wenger 1999; Natural Resources Conservation Services 2007; Lee et al. 2004); however, the entire width of the corridor should function as a buffer area.

Vegetation species should be chosen on the basis of low maintenance and the ability to set deep roots into the soil. Suggestions for proposed vegetation species (Newton 2006):

- Shrubs: American Cranberrybush, Black Chokeberry, Common Elderberry, Drooping Leucothoe, Highbush Blueberry, Redosier Dogwood, Silky Dogwood, Wax Myrtle, Winterberry
- Trees: Red Maple, River Birch, Silver Maple
- Groundcovers: Green and Gold, Woodland Phlox, Creeping Phlox, Sensitive Fern, Lowbush Blueberry
- Grasses (naturalized areas): Virginia Wild Rye, Wildlife Seed Mix, Little Bluestem
- Perennials: New York Ironweed, Black-eyed Susan, Joe-pye Weed, Wild Bergamot, Beebalm, Butterfly Weed

Cost estimate of post-construction buffer zone replanting (Earley 2012):

- Riparian and wetland seed mix application at 25lb/acre: \$90/lb or \$2,250/acre.
- Buffer enhancement using native hardwood species to 400 stem/acre: \$8-10/1.gal. Container, 1-2 acres equals \$3,200-288,000.

Proposed Action: Fauna

Birdhouses. (specifically targeting the brown-headed nuthatch and bluebird)

- Three additional bluebird birdhouses: \$65.84, \$158.04 with poles. Birdhouses placed between four and six feet above ground, preferably on a pole. Birdhouse must face East.

- Three additional bluebird birdhouses with the modification of an excluder, a metal ring placed over the nest box hole of the bluebird box that restrict the size of the hole to one inch in diameter: \$74.69. The nesting box should be placed at least five feet above the ground but no higher than ten feet. The nest should have two to three inches of dry sawdust in the bottom.
- The six birdhouses will be distributed evenly along the corridor, mostly in zone 11, with one birdhouse in zone 8 (Figure 2). As shown in figure 2, we will install birdhouses at least the suggested minimum distance of 150 feet apart from each other.
- The University of Richmond Geographic Society will be responsible for maintaining the birdhouses. They will be cleaned out every September for new fledglings.

Bat Houses. We recommend placing two bat houses 10-30 yards from the tree cover, and less than ¼ mile away from the stream. The bat house will be orientated south to receive maximum hours of direct sunlight. The bat houses will be black to maintain high temperatures inside when under direct sunlight. The “Bat Bunker Plus” branded bat house is the best option due to its large size. More bats will be able to live in this area per the number of suitable spots we have to place the boxes. Along with being high capacity, this model bat box is constructed with a plastic shell around a wooden core. Plastic shielding allows this bat house to be maintenance free for its entire life and the black color will never fade. Traditional wooden bat houses need to be replaced due to natural wear and tear, costing labor and temporarily displacing the bats. Each bat house has a theoretical max population of roughly 300 Big-Eared bats. The addition of these bat houses to the trail will enable up to 600 individuals of the endangered Virginia Big-Eared bat to settle in the corridor.

Bee Habitat. We will plant lilacs, lavender, and rosemary along the corridor. These plants will enhance the aesthetics of the corridor and also encourage pollination from university bees. Small, non-invasive weeds along the corridor will be kept at bay as dandelions and wildflowers help bee populations grow (Amundson 2016).

Outcomes: Flora

- Pollution and sediment runoff will be reduced
- Streambank erosion and flooding will be controlled
- Infiltration and groundwater recharge will be promoted
- Increased shade will decrease water temperatures
- Habitat for terrestrial wildlife will grow

(Washington State Dept. of Ecology 2016; Newton 2006)

Outcomes: Fauna

- Populations of brown-headed nuthatches in the corridor will approximately double
 - Estimated 9-15 brown-headed nuthatches born in the corridor every year and 12-15 new bluebirds every year. (Withgott and Smith 2013, Gowaty and Plisner 2015).
- Birdwatching in the corridor will increase
- Addition of 600 bat nesting spots to the corridor.
 - Compatible habitat for the Endangered Virginia Big-Eared bat.
- Bees on campus community will benefit from bee-friendly plants.

Discussion: Flora

The Gambles Mill Corridor is a large area, and not one that can be cleared of invasives in a week. It will take frequent, sustained efforts for six to eight years (James River Park System 2016; Mattrick 2017) to effectively control invasive populations and introduce native species. To remove all invasive species in the corridor will require either independent contractors or a directed effort by university staff. Student involvement in the project will be beneficial, but will be more useful for long-term maintenance of the corridor than for the initial removal of invasive species. With that in mind, we divided the corridor into eleven zones by physical characteristics (Figure 1). Dividing work by zone and targeting one zone at a time will allow feasible goals and focused management plans depending on

the predominant invasive in each zone. Replacing the plants in the corridor will produce a new and revitalized palette of vegetation that will promote native flora and better filter water in the Little Westham Creek watershed.

Discussion: Fauna

The benefits of maintaining a dynamic population of native wildlife along the Gambles Mill Corridor are immeasurable. The University of Richmond can play an integral part in the growth of many declining species, including the brown-headed nuthatch, the bluebird, the Big-Eared bat, and the American bumble bee. Furthermore, by creating a flourishing habitat for these species, we will incentivize more people to use the trail and benefit from this third space on the University of Richmond campus.

Conclusion

Restoring the Gambles Mill Corridor to foster native plants and animals will increase aesthetic appeal and wildlife watching opportunities, driving students, faculty, and community members to visit the area. Exposure to nature through this green space will in turn improve the overall physical and mental health of people living near the corridor (Barton and Pretty 2010). Additionally, the corridor will function as a living laboratory for university classes while contributing to the health of the James River and the Chesapeake Bay. By promoting the long term sustainability of the Gambles Mill Corridor, the University of Richmond will demonstrate its prioritization of student health, availability of third spaces on campus, and sustainable environmental practices.

Zones on the Gambles Mill Corridor



— Little Westham Creek
□ Zones

0 0.05 0.1 Miles

Figure 1: GIS map of identified zones on the Gambles Mill Corridor along with online interactive version <http://arcg.is/0KH9az> . Each zone is defined by land cover as well as prominent features. Includes pictures for each zone as well as location of pipe and manhole covers.

Birdhouses on the Gambles Mill Corridor



Figure 2: GIS map of current birdhouse locations as well as proposed birdhouse locations.

Proposed locations follow suggested guidelines for bluebird and nuthatch houses.

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